A320 Alerting Issues – Uncommanded yaw or roll

1. Initiating Condition: Wake encounter

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	ECAM red warning AUTO FLT AP OFF	A/P disconnects at bank angle > 45 deg	Autopilot disconnection is a secondary effect and a possible distractor			
Aural Alerts	None					
Tactile Alerts	None					
Visual Cues	PFD displays roll rate and upset attitude		Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	PFD displays chevrons indicating the direction to pitch for recovery	Pitch attitude +/- 15 degrees	Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	PFD symbols disappear (except for attitude, speed, heading, altitude, and vertical speed information)	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion	Removal of normal cue is not a salient cue to the upset, but it does remove potentially distracting information from the PFD helping the pilot to focus on attitude		
	FD bars disappear	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion	Removal of normal cue is not a salient cue to the upset, but it does remove potentially distracting information from the PFD helping the pilot to focus on attitude		

A320 Alerting Issues – Uncommanded yaw or roll

1. Initiating Condition: Wake encounter – Cont.

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Aural Cues	Autopilot disconnect tone	A/P disconnects at bank angle > 45 deg	Autopilot disconnection is a secondary effect and a possible distractor			
Tactile/ Somatic Cues	None					

Expected Pilot Response(s)

- Monitor aircraft's automated roll from upset attitude toward 33 degree maximum.
- Intervene with roll and/or pitch inputs if necessary.
- (no published procedure)

Possible sources of confusion with regard to pilot response(s)

- Who is flying? --the aircraft or the pilot?

How does pilot know condition is resolved/recovered?

- Return to controlled flight.

A320 Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	None					
Aural Alerts	None					
Tactile Alerts	None					
Visual Cues	PFD displays yaw/roll rates		Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	PFD displays skid/sideslip condition on turn coordination indicator					
	PFD symbols disappear (except for attitude, speed, heading, altitude, and vertical speed information)	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	FD bars disappear	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion			

A320 Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks – Cont.

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Cues	Aileron, spoiler, and rudder positions displayed on the ECAM F/CTL (flight control) page			This information must be obtained by performing keyboard selections; thus has zero salience unless the pilot recalls the existence of the page, applies this to the existing situation, and effortfully makes the required entries		
Aural Cues	None					
Tactile/ Somatic Cues	Uncommanded rudder pedal movement	Uncommanded rudder pedal deflection (in the direction opposite to that required) may occur if the rudder is jammed and thus cannot fulfill orders from the flight control computers	A jammed rudder may paradoxically be cued by pedal motion (per FCTL Rudder Jam procedure)			
	Lateral-g from uncommanded yaw					

Expected Pilot Response(s)

- Monitor aircraft's automated roll from upset attitude toward 33 degree maximum.
- Intervene with roll and/or pitch inputs if necessary.
- Perform F/CTL Rudder Jam procedure if cued by uncommanded rudder pedal movement.

A320 Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks – Cont.

Possible sources of confusion with regard to pilot response(s)

- Bank angle may exceed 33 degrees even though aircraft remains in normal law, depending on the bank angle at onset of the uncommanded rudder and the existing airspeed. Pilot response may be affected by surprise (because this bank angle is never supposed to be exceeded in normal law) and confusion as to whether the aircraft actually remains in normal law.
- Aircraft applies opposing roll control inputs (aileron and spoiler) but there is no feedback of these inputs to the sidestick.
- If the aircraft stabilizes in a steady heading sideslip, the lateral g cues will be reduced/eliminated and the pilots may have difficulty identifying what is happening (unless there is feedback to the rudder pedals), but the situation will be relatively stable.
- Who is flying? --the aircraft or the pilot?

How does pilot know condition is resolved/recovered?

- Pilot can check aileron, spoiler, and rudder positions on the ECAM F/CTL (flight control) page.

Issues with regard to multiple concurrent non-normal conditions

- If rudder deflection continues to subsequent flight phases, there may be implications for control during approach and landing; there is no published procedure to rectify the rudder deflection or mitigate these risks (however unlikely).

A320 Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat deflection

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	None					
Aural Alerts	None					
Tactile Alerts	None					
Visual Cues	PFD displays roll rate		Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	PFD symbols disappear (except for attitude, speed, heading, altitude, and vertical speed information)	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	FD bars disappear	Bank angle > 45 deg	Cue is not definitive as to underlying cause of uncommanded aircraft motion			
	Aileron, spoiler, and rudder positions displayed on the ECAM F/CTL (flight control) page			This information must be obtained by performing keyboard selections; thus has zero salience unless the pilot recalls the existence of the page, applies this to the existing situation, and effortfully makes the required entries		
Aural Cues	None					
Tactile/Somatic Cues	None					

A320 Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat deflection – Cont.

Expected Pilot Response(s)

- Monitor aircraft's automated roll from upset attitude toward 33 degree maximum.
- Intervene with roll and/or pitch inputs in an attempt to control the rolling moment.
- Recognize that automation and manual roll inputs are ineffective in regaining control, and apply manual rudder pedal inputs to oppose the roll.
- (no published procedure)

Possible sources of confusion with regard to pilot response(s)

- Bank angle will likely exceed 33 degrees even though aircraft remains in normal law, because the rudder's authority for automated inputs in constrained by yaw damper limits, and pilot response may be delayed due to dependence on the automation until it becomes more apparent that the automation cannot control the rolling moment. Pilot response may be affected by surprise (because this bank angle is never supposed to be exceeded in normal law) and confusion as to whether the aircraft actually remains in normal law.

How does pilot know condition is resolved/recovered?

- Pilot can check aileron, spoiler, and rudder positions on the ECAM F/CTL (flight control) page.

Issues with regard to multiple concurrent non-normal conditions

- If aileron/spoiler deflection continues to subsequent flight phases, there may be implications for control during approach and landing; there is no published procedure to rectify these uncommanded control surface deflections or mitigate these risks (however unlikely).